

ROTEL®

RA-1312

STEREO INTEGRATED AMPLIFIER

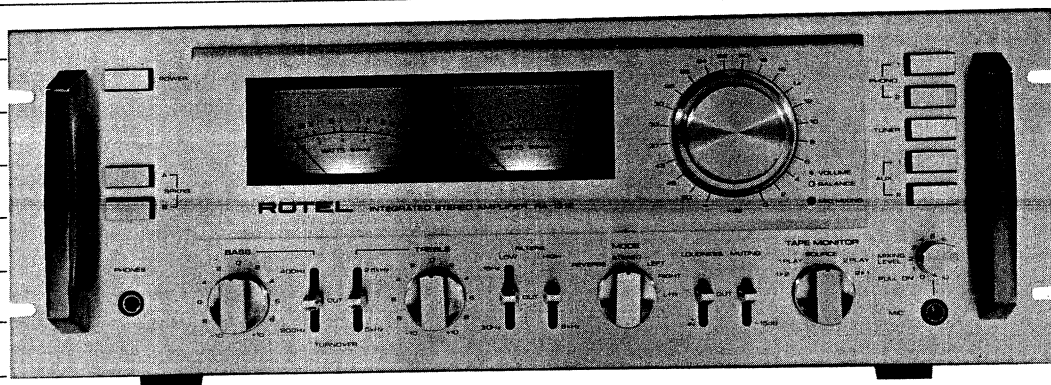
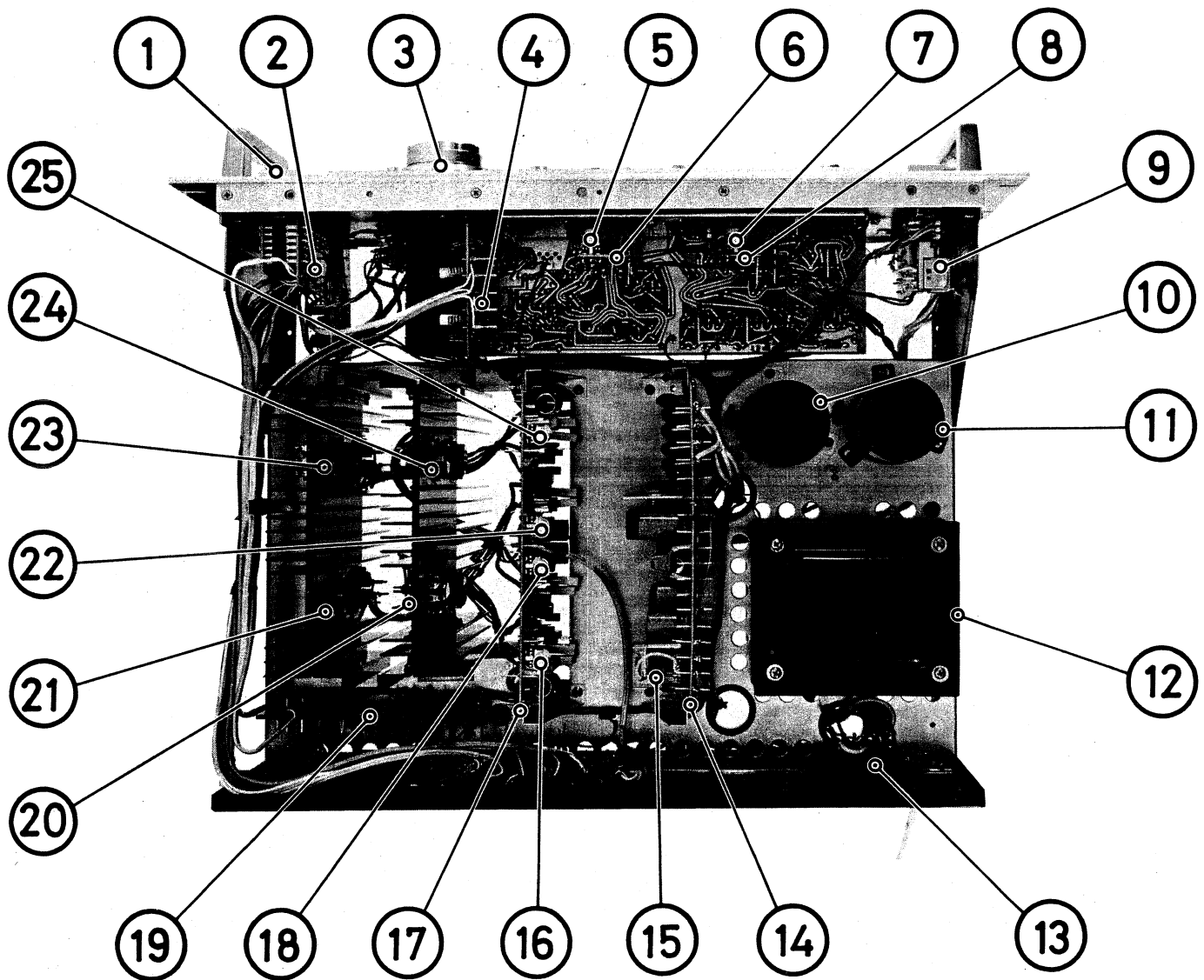


TABLE OF CONTENTS

CHASSIS LAYOUT	PHONO AMP. CIRCUIT BOARD DIAGRAM	13
(TOP VIEW)	MIC. AMP. CIRCUIT BOARD DIAGRAM	13
(BOTTOM VIEW)	TONE CONTROL AMP. CIRCUIT BOARD DIAGRAM	14
PRECAUTION	VOLUME CONTROL AMP. CIRCUIT BOARD DIAGRAM	15
POWER AMP. BIAS ADJUSTMENT	WATTS METER CIRCUIT BOARD DIAGRAM	15
WATTS METER CALIBRATION	MAIN AMP. CIRCUIT BOARD DIAGRAM	16
OVERLOAD PROTECTION LEVEL ADJUSTMENT	POWER SUPPLY & OVERLOAD PROTECTOR CIRCUIT	
TROUBLE SHOOTING GUIDE	BOARD DIAGRAM	17
GAIN DIAGRAM	REPAIR PARTS LIST	18
SCHEMATIC DIAGRAM (1)		7
SCHEMATIC DIAGRAM (2)		10

TECHNICAL MANUAL 68

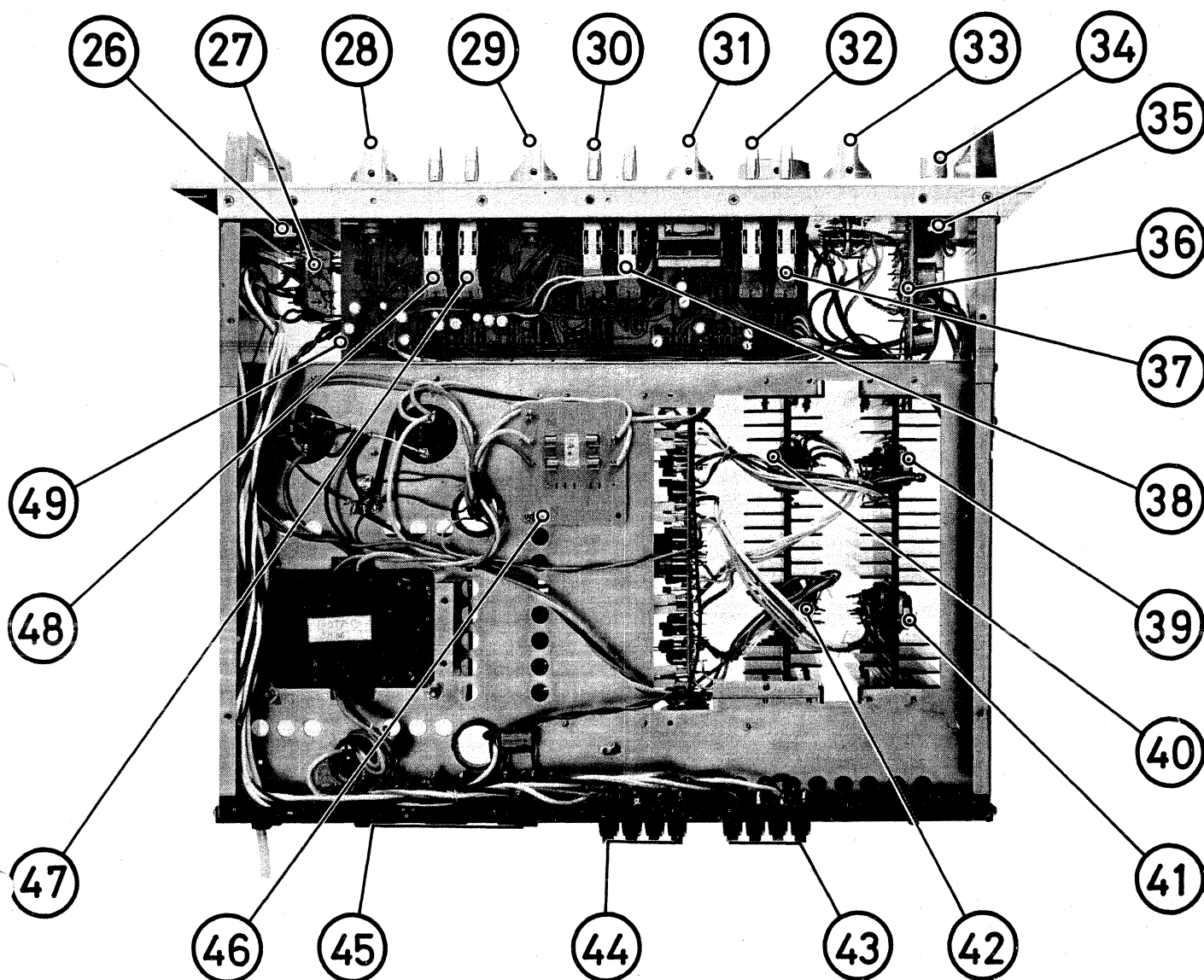
CHASSIS LAYOUT (TOP VIEW)



1. PHONO SWITCH
2. FUNCTION SELECTOR PCB
3. BALANCE & VOLUME CONTROL
4. VOLUME CONTROL PCB
5. WATTS METER LEVEL ADJ., R-CH.
6. WATTS METER PCB
7. WATTS METER LEVEL ADJ., L-CH.
8. WATTS METER PCB
9. POWER SWITCH
10. C002, SMOOTHING CAPACITOR
11. C001, SMOOTHING CAPACITOR
12. T001, POWER TRANSFORMER
13. VOLTAGE SELECTOR

14. POWER SUPPLY PCB
15. RY901, OVERLOAD PROTECTION RELAY
16. VR603, OVERLOAD PROTECTION LEVEL ADJ., L-CH.
17. MAIN AMP. PCB
18. VR601, POWER AMP. BIAS ADJ., L-CH.
19. PHONO EQUALIZER AMP. PCB
20. Q001, POWER AMP., L-CH.
21. Q006, POWER AMP., R-CH.
22. VR602, POWER AMP. BIAS ADJ., R-CH.
23. Q002, POWER AMP., R-CH.
24. Q005, POWER AMP., L-CH.
25. VR604, OVERLOAD PROTECTION LEVEL ADJ., R-CH.

CHASSIS LAYOUT (BOTTOM VIEW)



- 26. HEADPHONE JACK
- 27. SPEAKER SWITCH PCB
- 28. BASS CONTROL
- 29. TREBLE CONTROL
- 30. LOW FILTER SWITCH
- 31. MODE SELECTOR SWITCH
- 32. LOUDNESS SWITCH
- 33. TAPE MONITOR SWITCH
- 34. MIC VOLUME CONTROL & MIC SWITCH
- 35. MIC JACK
- 36. MIC AMP. PCB
- 37. MUTING SWITCH
- 38. HI-FILTER SWITCH

- 39. Q004, POWER AMP., R-CH.
- 40. Q007, POWER AMP., L-CH.
- 41. Q008, POWER AMP., R-CH.
- 42. Q003, POWER AMP., L-CH.
- 43. SPEAKER "A" TERMINALS
- 44. SPEAKER "B" TERMINALS
- 45. AC OUTLETS
- 46. AC FUSE PCB
- 47. TREBLE TURNOVER SWITCH
- 48. BASS TURNOVER SWITCH
- 49. TONE CONTROL AMP. PCB

PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacements for output and driver transistors, if necessary, must be made from the same hfe group as the original type.
4. If one output transistor burns out (open or short), always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohm-meter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.
5. When mounting a replacement power transistor, be sure the bottom of the flange, the mica inculators and the surface of the heat sink are free of foreign matter, for they may cause transistors failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

POWER AMP. BIAS ADJUSTMENT

NOTE: Prior to BIAS ADJUSTMENT, run about 5 minutes with rated output (8Ω) and warm up Power transistor and Heat Sink.

Prior to adjustment, move VR601 and 602 potentiometers one full turn clockwise.

..... In RA-1312, Bias Current will decrease when VR601 and 602 are turned clockwise, and it will increase when turned counterclockwise.

Instruments: DC millivolt meter

- a. Set volume control to minimum (i.e. no signal input).
- b. Connect the plus lead of a DC millivolt meter to Test pin No.29 (on main amp. pcb) and minus lead to pin No.31.
- c. Adjust potentiometer VR601 (on main amp. pcb) to obtain a 25mV reading on DC millivolt meter.
- d. Repeat the above steps 1 and 2, for Right channel (use test pins No.30, 32 and potentiometer VR602).

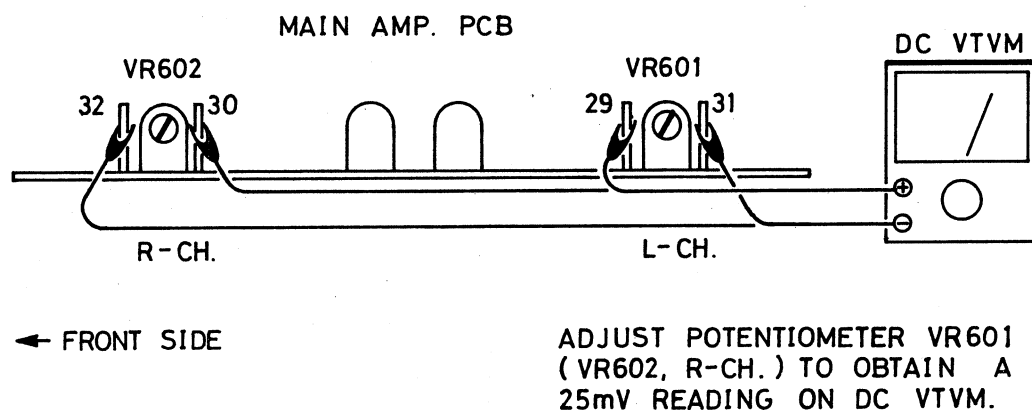


Fig.1 BIAS ADJUSTMENT HOOK-UP

WATTS METER CALIBRATION

Instruments: Audio Generator and AC VTVM

- Set Function Selector to AUX-1 position.
 - Set Bass and Treble to "0" (Center) position, or Tone Switch to defeat position and Muting, Loudness, High Filter and Low Filter Switches to "OFF" position. And Set Mode Switch to "L+R" position.
- a. Connect 8-ohm (50W) resistors to right and left Speaker "A" Terminals.
 - b. Connect AC VTVM in parallel with this 8-ohm load of "L" or "R" channel.

- c. Connect Audio Generator to input terminal of "L" or "R" channel and apply 1KHz (sine wave) signal. And adjust input level so that reading on AC VTVM is 9 V (10 watts/8-ohm).
- d. Turn and adjust VR701 so that watts-meter indicates 10 watts.
- e. Then decrease input level by 10dB (output 1 watt=2.83 V/8-ohm) and make sure that reading on watts-meter is 1 watt.
- f. Proceed the above steps from b. to e. for the other channel.

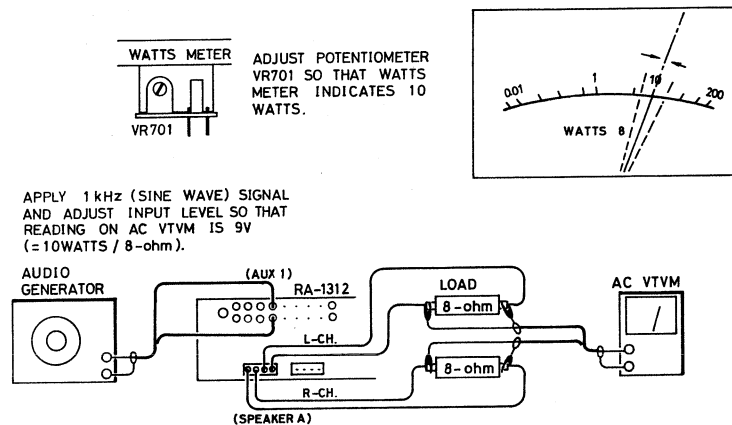


Fig.2 WATTS METER CALIBRATION HOOK-UP

OVERLOAD PROTECTION LEVEL ADJUSTMENT

Instruments: Audio Generator and H.D. Analyzer

- Be sure to make this adjustment with one channel driven.
 - Set Function Selector to AUX-1 position.
 - Set potentiometers VR603 and 604 to counterclockwise position before starting this procedure.
- a. Connect 4Ω 200W load resistor to output terminals (speaker A) "L" or "R", then connect H.D. Analyzer in parallel.

- b. Connect audio generator to AUX-1 input terminal "L" or "R" and apply 100Hz (sine wave) signal. Adjust input level so that reading on H.D. Analyzer is 1% distortion.
- c. Turn potentiometer VR603 or 604 so that the Protection Relay is disengaged.
- d. Adjust input level to confirm that the Relay remains activated when the output distortion is 0.1%.
- e. Proceed the above steps from b. to d. for the other channel.

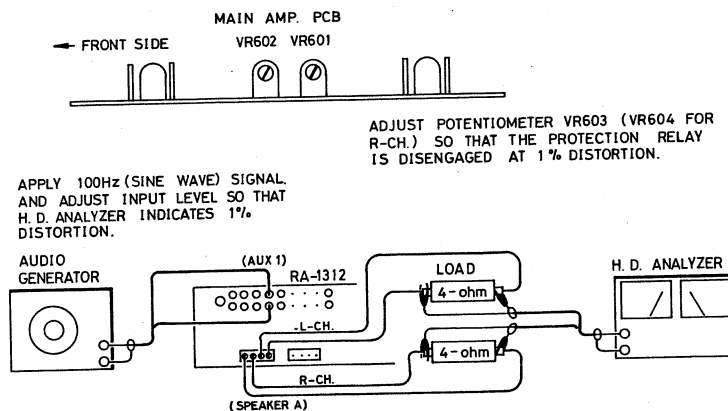


Fig.3 OVERLOAD PROTECTION LEVEL ADJUSTMENT HOOK-UP

TROUBLE SHOOTING GUIDE

I. Unit Inoperative

A. Meter lamps do not light.

1. Power switch may be faulty, or
2. Power Transformer may be faulty.

B. Meter lamps light, check to see if AC Fuse, F901 or 902 is blown.

1. If AC Fuse is blown.
 - a. Rectifier, D905, 906, 907, 908, 909, 910, 911 or 912 may be shorted out, or
 - b. Capacitor, C427, 428, 431, 907, 908, 911, 912, 913, 001 or 002 may be faulty.
2. If AC Fuse is OK, check to see if Overload Protection Relay, RY901, operates properly.
 - a. If the Relay does not operate.
 - 1) Main Amp. Circuit may be shorted out, or
 - 2) Output Circuit (including speaker system) may be shorted, or
 - 3) Relay, RY901, may be faulty, or
 - 4) Relay switch (gang with Power Switch) may be faulty.

II. Left or Right channel inoperative, check to see if there is a signal at PRE OUT Terminal.

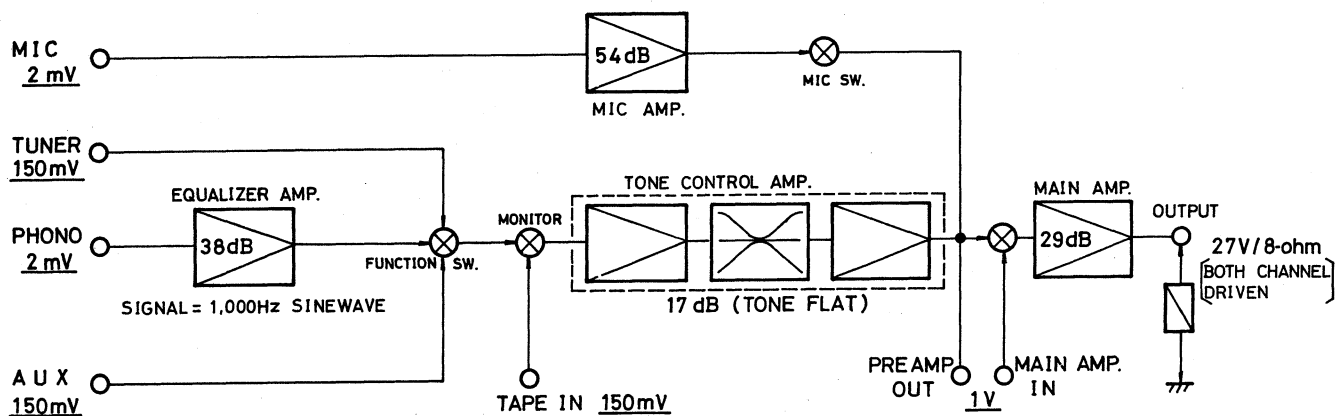
A. If there is a signal.

1. Main Amp. Circuit may be Faulty, or
2. PRE-MAIN Switch may be faulty.
3. Contact point of Protection Relay may be faulty.

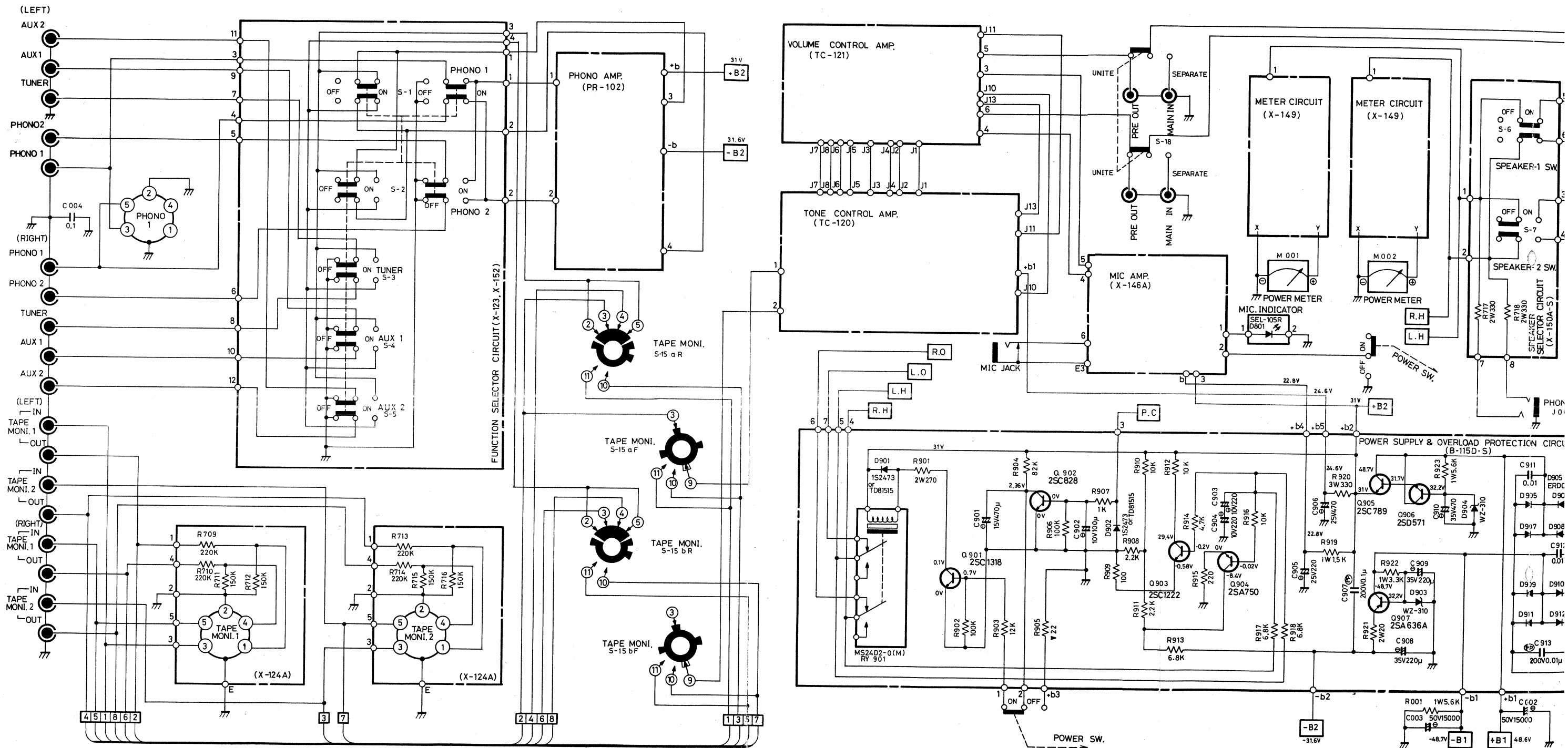
B. If there is no signal.

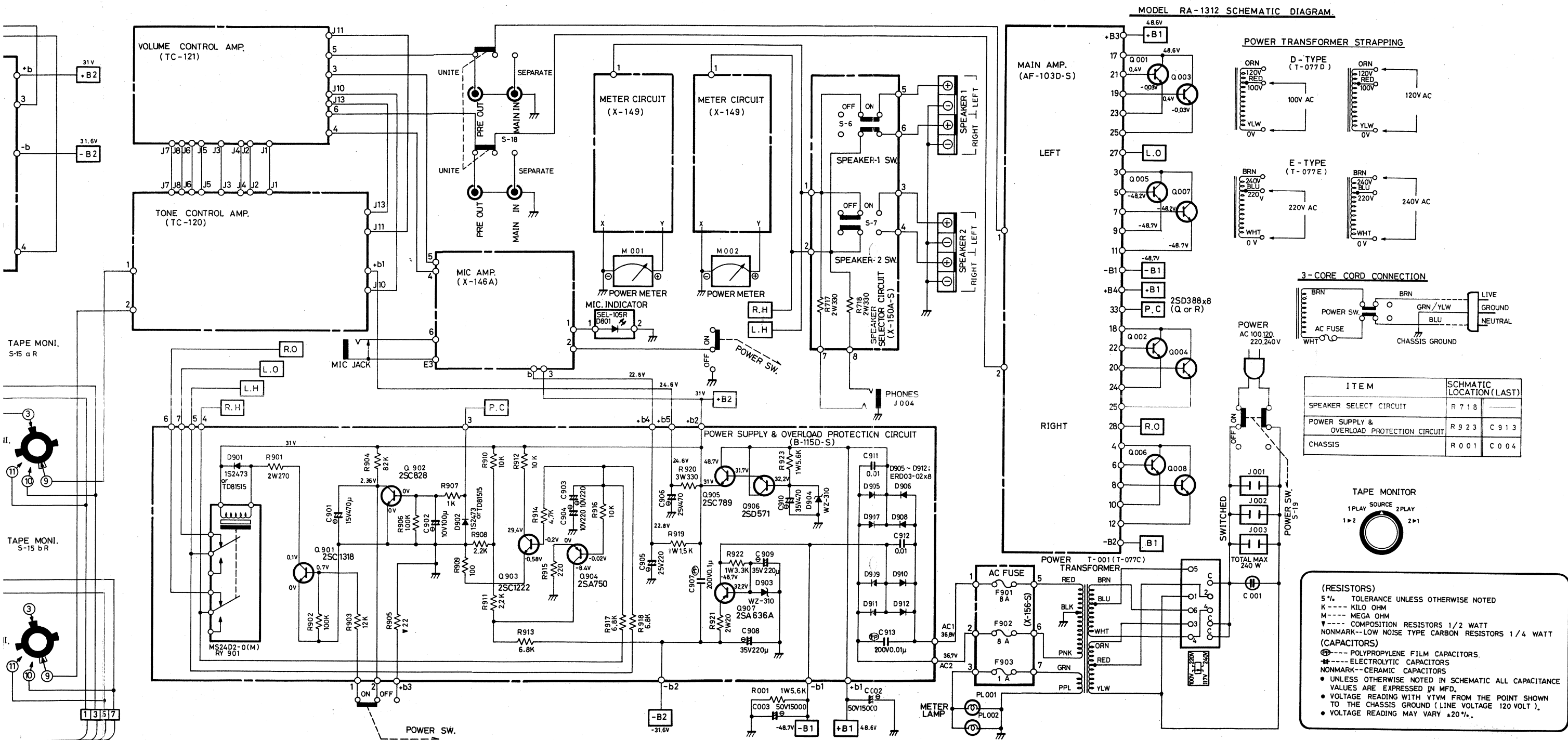
1. Check the each transistor of preamplifier circuits.
2. Check the each coupling capacitor of preamplifier circuits.

GAIN DIAGRAM



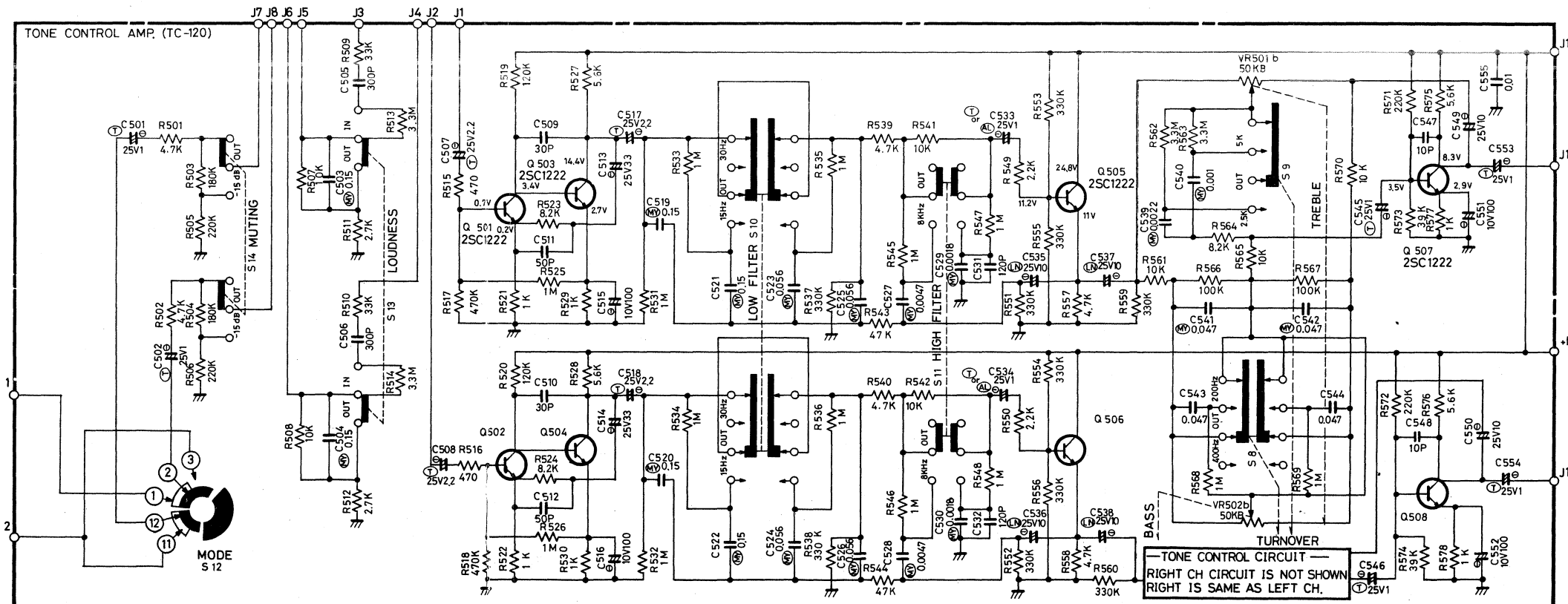
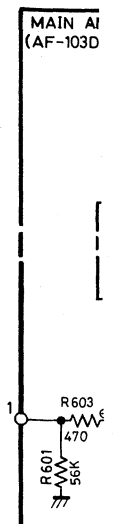
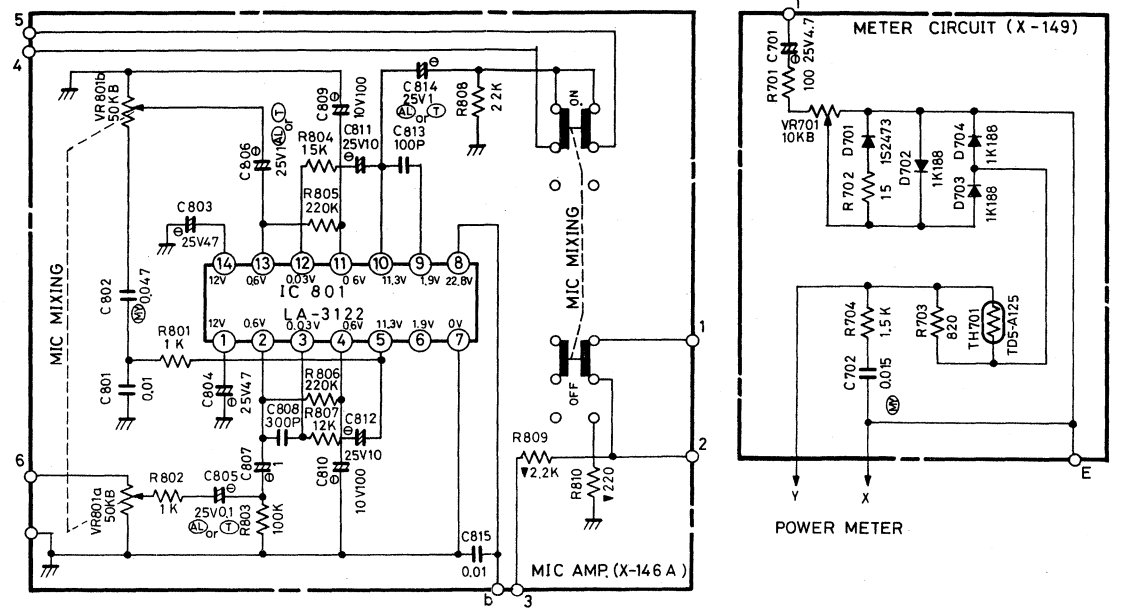
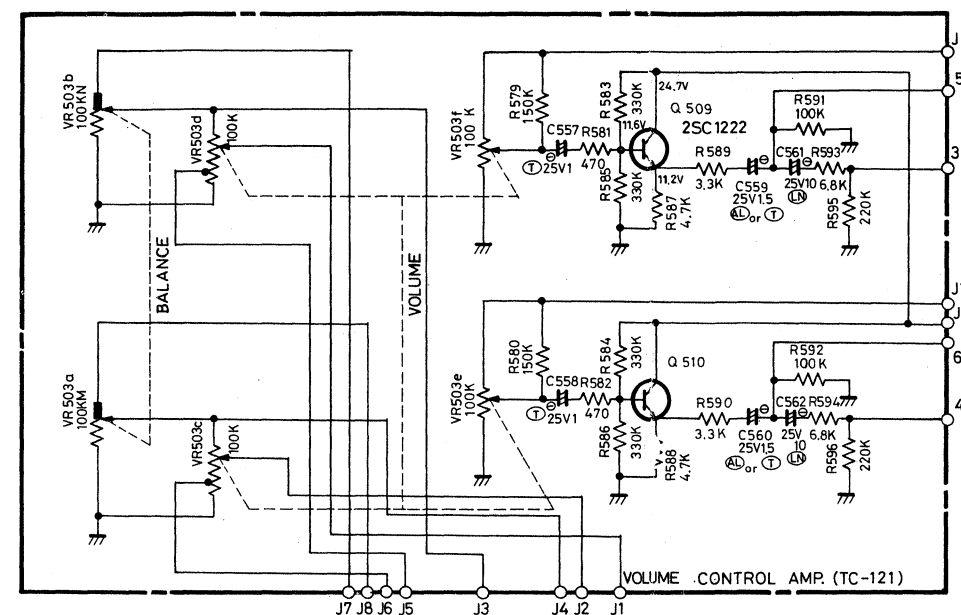
SCHEMATIC DIAGRAM



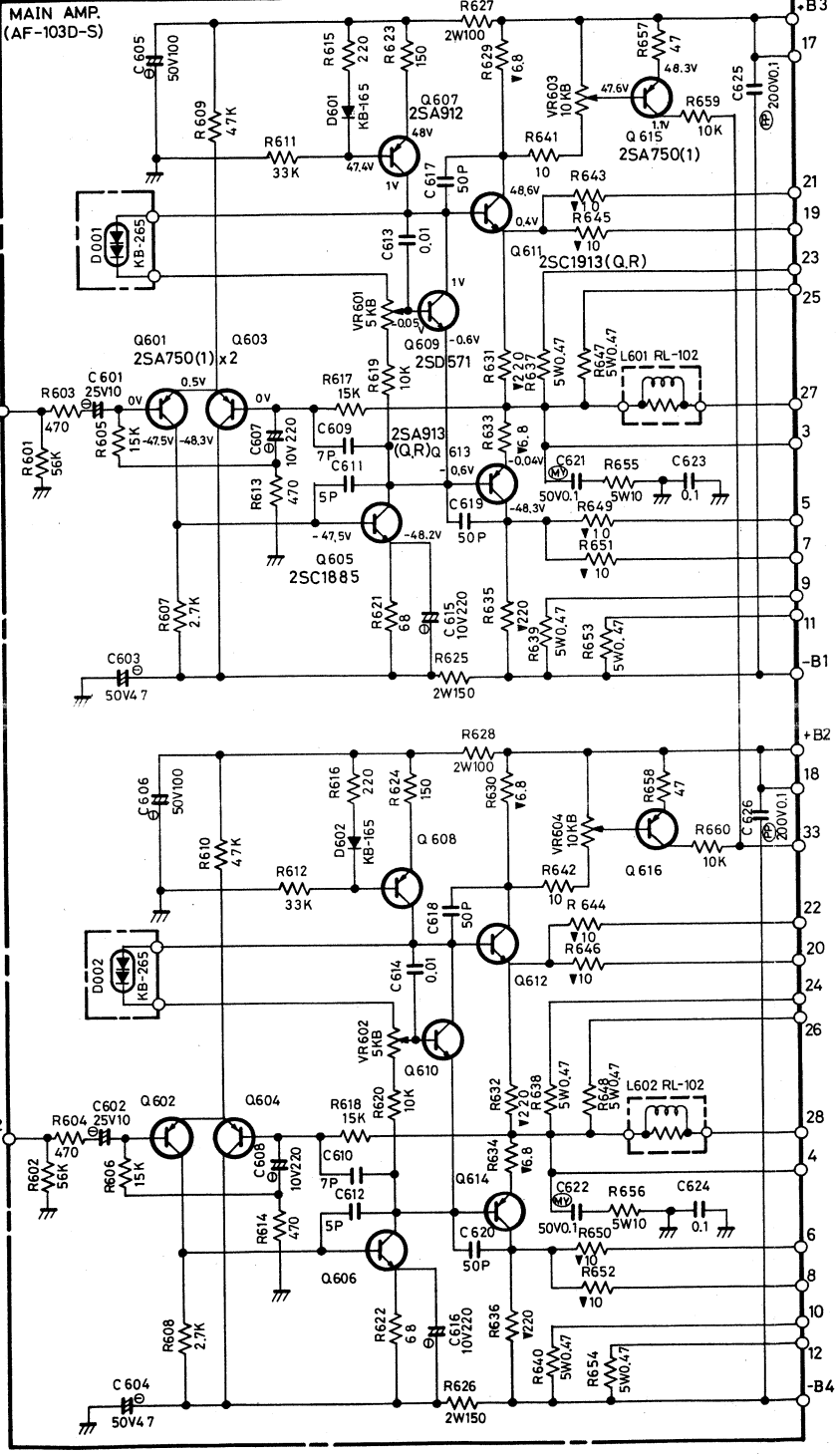
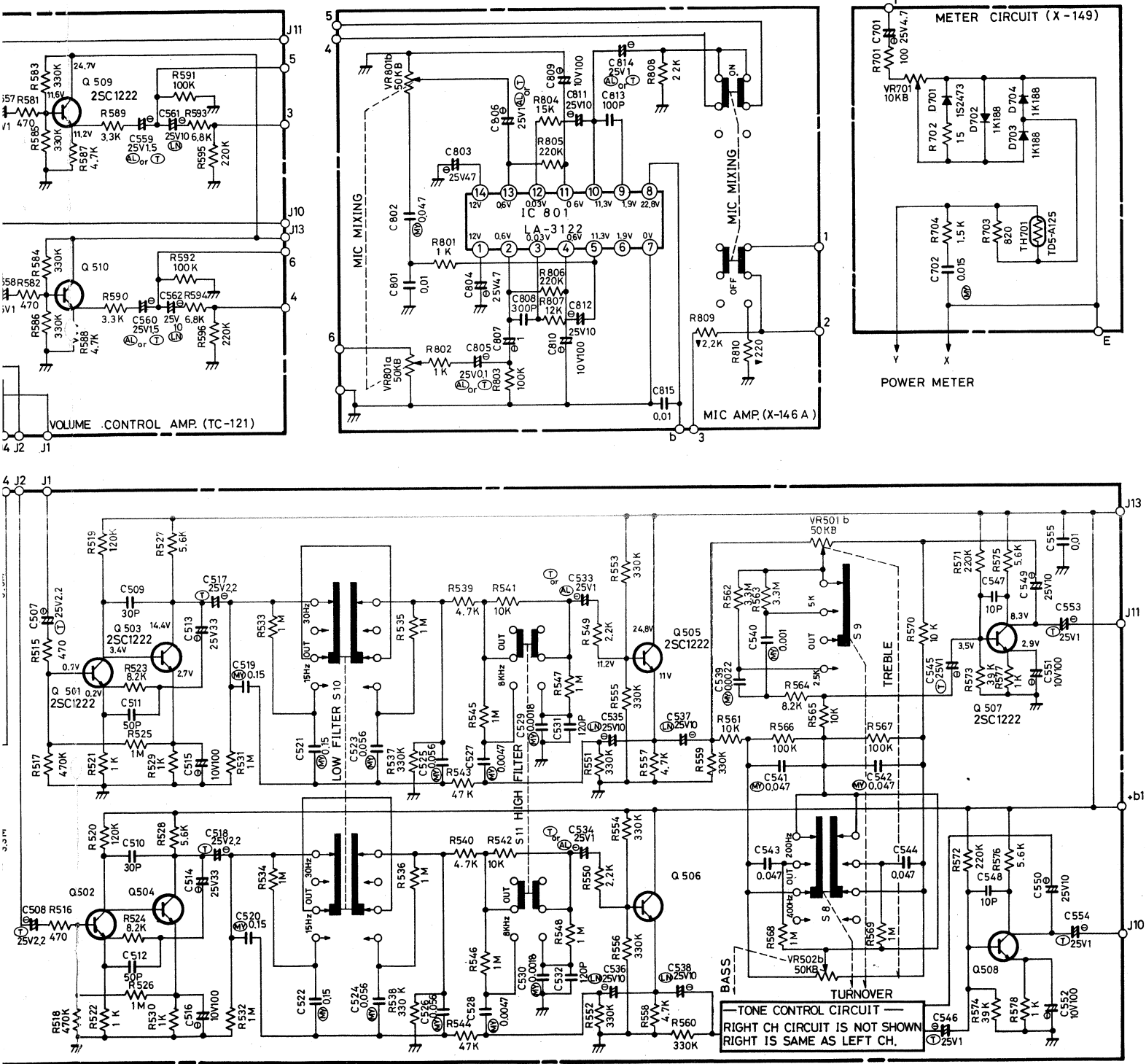


The schematic diagram illustrates the internal circuitry of a Phono Amp (PR-102). It features a multi-stage design starting with an input section that includes a 2mV and 4mV input impedance (INPUT IMP.) and a 250V0.047V input sensitivity (INPUT SENS.) control. The signal path continues through several transistor stages, including a 2SC1400 (Q407) and a 2SA750(1) (Q409). The circuit is populated with numerous resistors (R401 through R444) and capacitors (C401 through C431), along with diodes (D401, D402, D403, D404, D405, D406, D407, D408, D409, D410, D411, D412, D413, D414, D415, D416, D417, D418, D419, D420, D421, D422, D423, D424, D425, D426, D427, D428, D429, D430, D431, D432, D433, D434, D435, D436, D437, D438, D439, D440, D441, D442, D443, D444, D445, D446, D447, D448, D449, D450, D451, D452, D453, D454, D455, D456, D457, D458, D459, D460, D461, D462, D463, D464, D465, D466, D467, D468, D469, D470, D471, D472, D473, D474, D475, D476, D477, D478, D479, D480, D481, D482, D483, D484, D485, D486, D487, D488, D489, D490, D491, D492, D493, D494, D495, D496, D497, D498, D499, D500). The output stage is driven by a 2SC1400 (Q407) and a 2SA750(1) (Q409) transistor pair, which is coupled to a 2SC1400 (Q408) and a 2SA750(1) (Q409) transistor pair. The circuit is powered by a 250V0.047V supply and includes a 250V0.047V output filter capacitor (C427).

PHONO AMP. (PR-102)



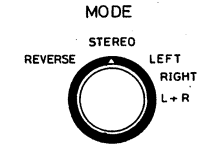
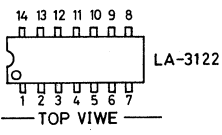
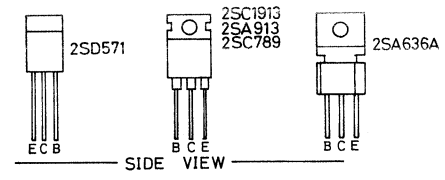
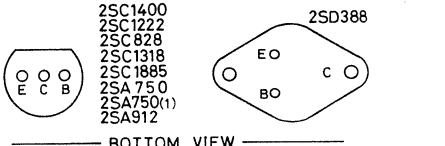
MODEL RA-1312 SCHEMATIC DIAGRAM



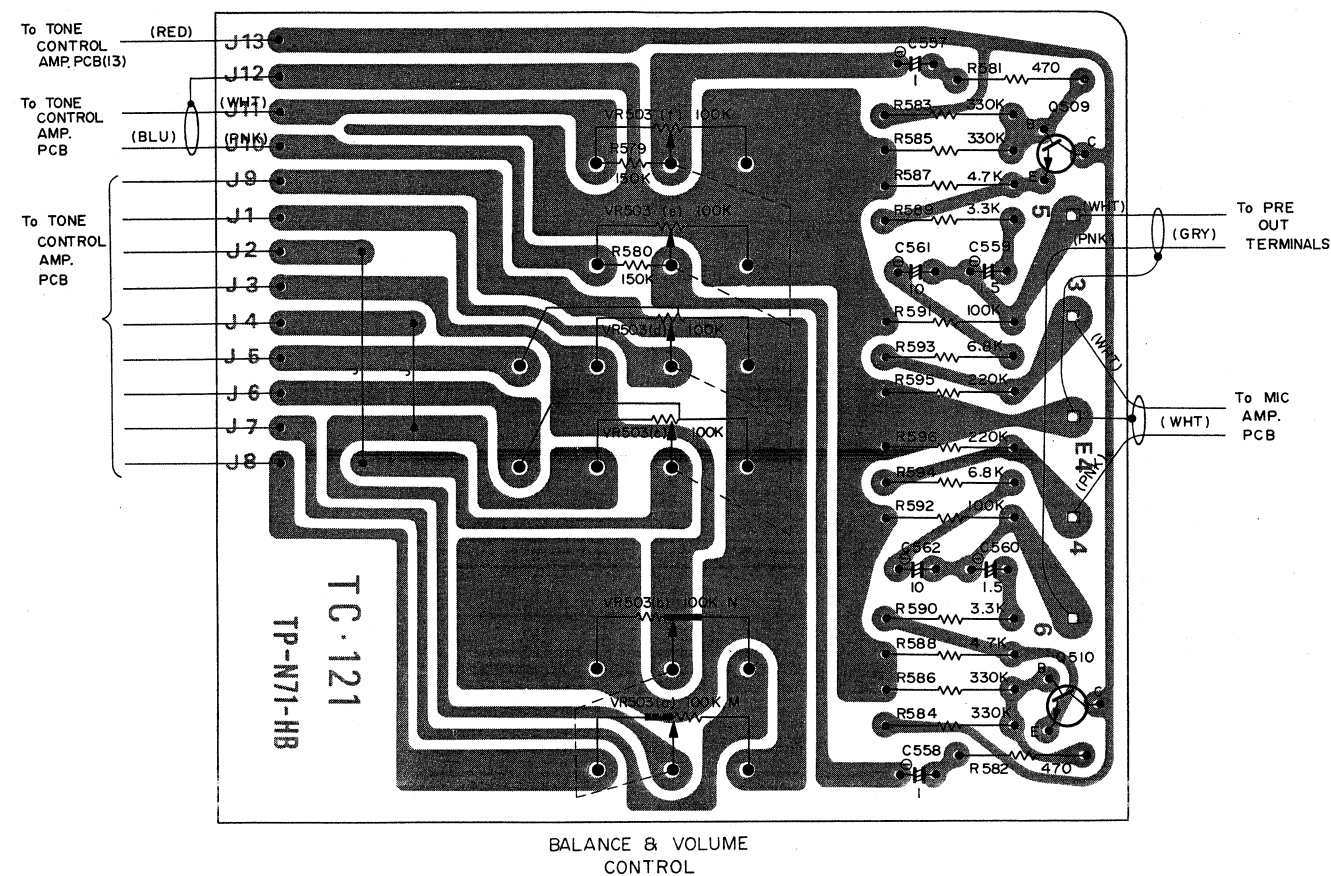
(RESISTORS)
5% TOLERANCE UNLESS OTHERWISE NOTED
K--- KILO OHM
M--- MEGA OHM
--- COMPOSITION RESISTORS 1/2 WATT
NONMARK--- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT

(CAPACITORS)
---MYLAR FILM CAPACITORS
---SINTERED ALUMINUM SOLID ELECTROLYTIC CAPACITORS (ALSI-CON)
---POLYSTYRENE FILM CAPACITORS
---TANTALUM CAPACITORS
---LOW NOISE TYPE CAPACITORS
---ELECTROLYTIC CAPACITORS
NONMARK--- CERAMIC CAPACITORS
UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120 VOLT).
VOLTAGE READING MAY VARY $\pm 20\%$.

ITEM	SCHEMATIC LOCATION
PHONO AMP. (PR-102)	R 4 4 4 C 4 3 1
VOLUME CONTROL AMP. (TC-120)	R 5 7 8 C 5 5 5
TONE CONTROL AMP. (TC-121)	R 5 9 6 C 5 6 2
MAIN AMP. (AF-103D-S)	R 6 6 0 C 6 2 6
METER AMP. (X-149)	R 7 0 4 C 7 0 2
MIC AMP. (X-146A)	R 8 1 0 C 8 1 5

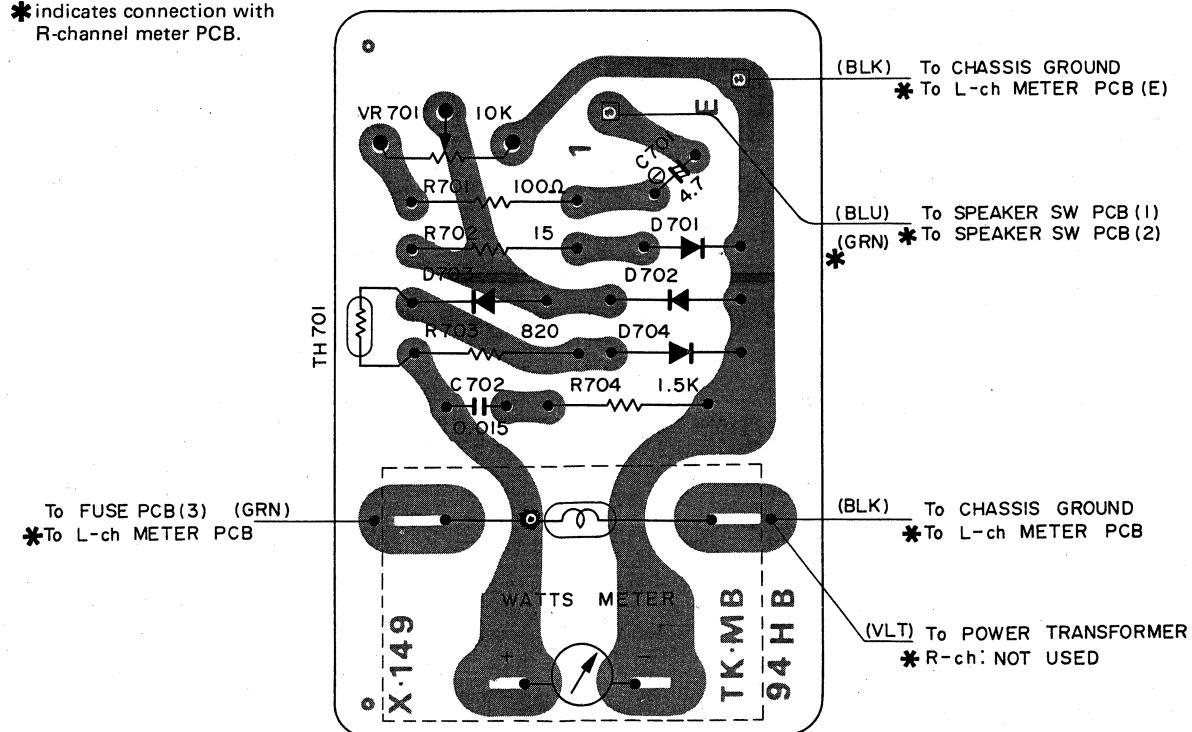


VOLUME CONTROL AMP. CIRCUIT BOARD DIAGRAM

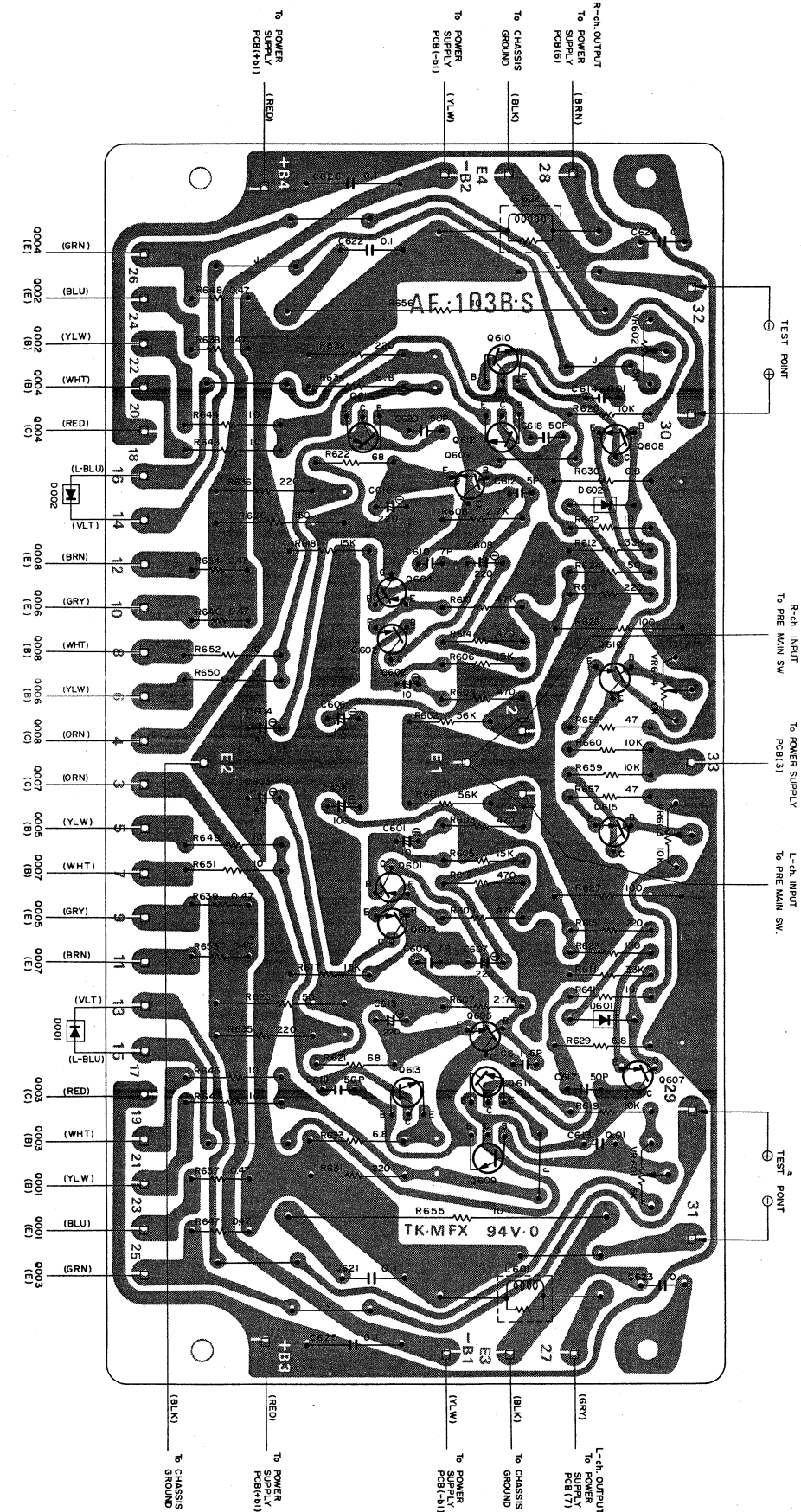


WATTS METER CIRCUIT BOARD DIAGRAM

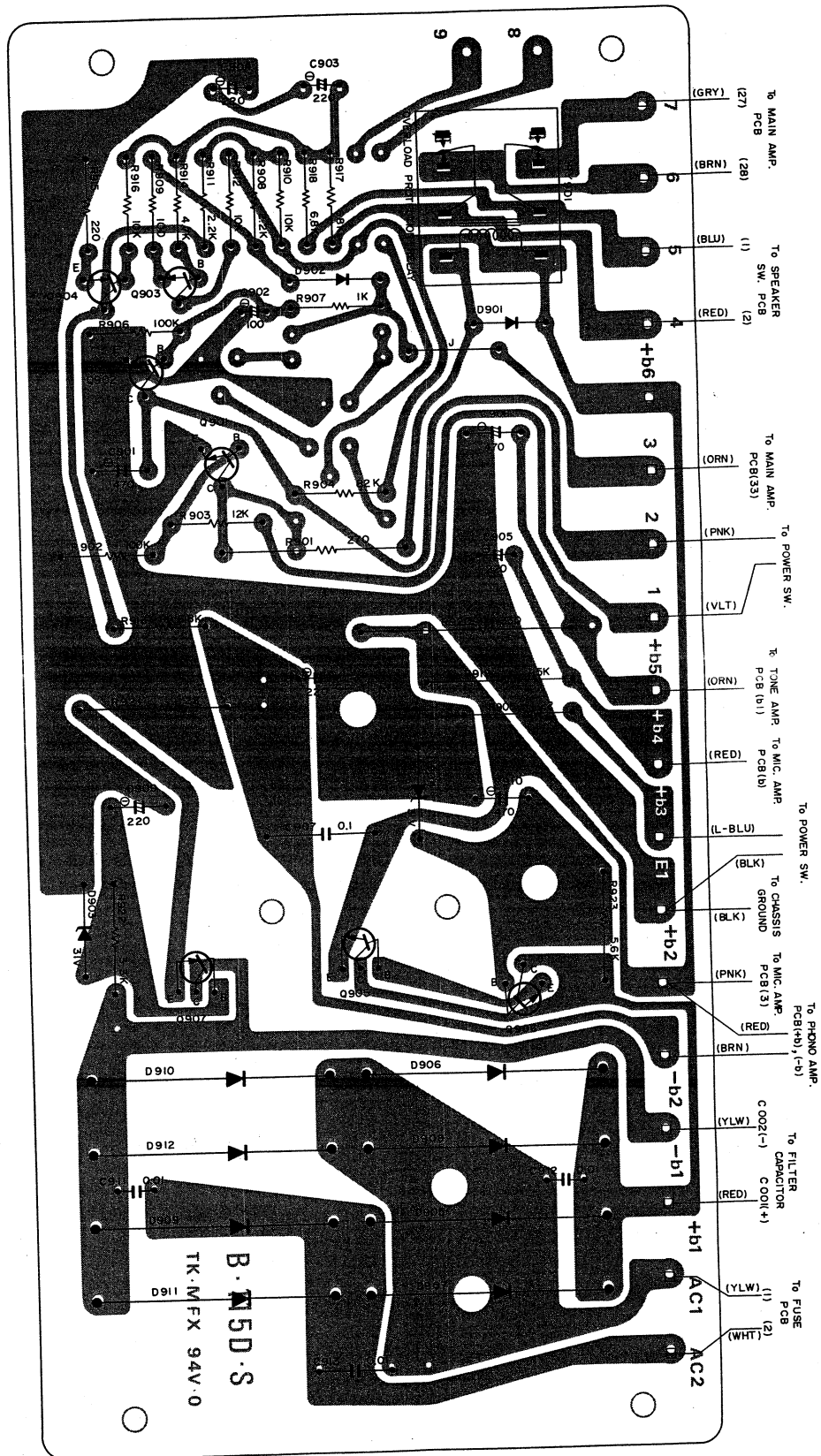
* indicates connection with R-channel meter PCB.



MAIN AMP. CIRCUIT BOARD DIAGRAM



POWER SUPPLY & OVERLOAD PROTECTOR CIRCUIT BOARD DIAGRAM



REPAIR PARTS LIST

Schematic Location	Part No.	Description
TRANSISTORS, DIODES and IC,s		
Q401, 402, 403, 404, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 903	301201156	2SC1222, Phono Amp., Tone Amp., etc.
Q405, 406, 409, 410, 601, 602, 603, 604, 615, 616	301001134	2SA750-1, Phono Amp., Main Amp.
Q605, 606	301201164	2SC1885, Predriver
Q607, 608	301001142	2SA912
Q609, 610, 906	301301134	2SD571, Bias Compensator, etc.
Q611, 612	301201165	2SC1913 (Q or R), Driver
Q613, 614	301001143	2SA913 (Q or R), Driver
Q901	301201155	2SC1318, Propection Relay Driver
Q902	301201115	2SC828, Overload Threshold
Q904	301001133	2SA750
Q905	301201142	2SC789, +B Stabilizer
Q907	301001141	2SA636A, -B Stabilizer
Q001, 002, 003, 004, 005, 006, 007, 008	301301133	2SD388 (Q or R)
D401, 402, 601, 602	300212008	KB-165, Varistor
D701, 702, 901, 902	300111010	1S2473
D703, 704, 705	300111008	1K188
D801	300414007	SEL-105R, Mic. Amp. Indicator
D903, 904	300313021	WZ-310, Zener Regulator, 31V
D905, 906, 907, 908, 909, 910, 911, 912	300919020	ERD-03-02, Power Rectifier
D001, 002	300212002	KB-265, Varistor
IC801	303452159	LA-3122, Mic. Amp.

Schematic Location	Part No.	Description
VARIABLE RESISTORS		
VR501, 502	525101140	50KBx2, Bass and Treble Control
VR503	525121133	100K M.N+100Kx4, Balance and Volume Control
VR601, 602	510502121	5KB, Power Amp. Bias Adj.
VR603, 604, 701	510502125	10KB, Overload Protection Level Adj., etc.
VR801	525101135	50KBx2, Mic. Level Control W/Mic. Switch
SWITCHES		
S1, 2, 3, 4, 5 (1 Set)	614051014	Push 5-key, Function Selector
S6, 7, 19 (1 Set)	614030812	Push 3-key, Speakers and Power Supply (100V-120V)
	614030813	Push 3-key, Speakers and Power Supply (220V-240V)
S8, 10	611001638	Bass Turnover, Low Filter
S9	611001637	Treble Turnover
S11	611001642	High Filter
S12	601011273	Mode Selector
S13, 14	611001641	Loudness, Muting
S15	601011285	Tape Monitor
S16, 17	613000023	Phono Input Sensitivity and Impedance Selector
S18	613000022	Unite-Separate
OTHERS		
RY901	240111226	Overload Protection Relay
TH701	511001111	TD5-A125, Thermistor
M001, 002	231310057	Watts Meter
T001	205001405	Power Transformer
	141510155	Phono Equalizer Amp. Circuit Board Assembly
	141810279	Tone Control Amp. Circuit Board Assembly
	141810280	Volume Control Amp. Circuit Board Assembly
	141810649	Mic. Amp. Circuit Board Assembly
	141610278	Main Amp. Circuit Board Assembly
	141810650	Watts meter Circuit Board Assembly
	141810653	Power Supply and Overload Protection Circuit Board Assembly
	141810652	Function Selector Circuit Board Assembly

THE ROTEL CO., LTD.

ROTEL ELECTRONICS CO., LTD.

ROTEL OF AMERICA, INC.

1-36-8 OHOKAYAMA, MEGURO-KU, TOKYO 152, JAPAN

310 SEC. 5, NANKING E. ROAD, TAIPEI, TAIWAN

2646 CENTRAL PARK AVE., YONKERS, N.Y. 10710, U.S.A.

Printed in Japan 76-07